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BASTERIA, 62: 7-24, 1998

The family Pyramidellidae (Heterostropha, Gastropoda) in the Black Sea

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Descriptions, distributional data and SEM photographs of species of the family Pyramidellidae from the Black Sea are presented. Fifteen species belonging to six genera can be identified: *Chrysallida emaciata* (Brusina, 1866); *Chrysallida incerta* (Milaschewitch, 1916); *Chrysallida fenestrata* (Jeffreys, 1848); *Chrysallida obtusa* (T. Brown, 1827); *Chrysallida terebellum* (Philippi, 1844); *Eulimella acicula* (Philippi, 1836); *Anisocycla pointeli* (de Folin, 1868); *Odostomia acuta* Jeffreys, 1848; *Odostomia erjaveciana* Brusina, 1869; *Odostomia eulimoides* Hanley, 1844; *Odostomia plicata* (Montagu, 1803); *Odostomia scalaris* MacGillivray, 1843; *Noemiamea dolioformis* (Jeffreys, 1848); *Turbonilla delicata* (Monterosato, 1874); *Turbonilla pusilla* (Philippi, 1844). The identity of *Chrysallida* cf. *pontica* Grossu, 1986 remains doubtful. The following identities have been established: *Parthenina tenuistriata* Milaschewitch, 1909 [= *Chrysallida obtusa* (Brown, 1827)]; *Parthenina costulata* Milaschewitch, 1916 [= *Chrysallida terebellum* (Philippi, 1844)] and *Odostomia rissioformis* Milaschewitch, 1916 [= *Odostomia scalaris* (MacGillivray, 1843)]. Thus all species are well known Mediterranean taxa with the possible exception of the poorly known *C. cf. pontica*.

Key words: Gastropoda, Heterostropha, Pyramidellidae, Black Sea, Sea of Azov.

INTRODUCTION

The Black Sea is an almost completely closed basin with unique geological, hydrological, hydrochemical and ecological characteristics, making it an area of particular zoological interest. The body of water lies between 40°55' and 46°32'N, and 27°27' and 41°42'E, with a total sea surface of about 413,000 km², and a total volume of approximately 537,000 km³. Its continental position, its connection with the Mediterranean via the Bosphorus and an annual fresh-water inflow of 230-350 km³ make it an unusual hydrological system. The region below a depth of 150-180 m is characterized by high quantities of dissolved hydrogen sulfide that makes higher plant and animal life impossible. The salinity of the Black Sea increases from within the α -mesohaline range (16-18 ‰) in the coastal areas up to the weak polyhaline range (about 22.5 ‰) at its greatest depths. The annual temperature fluctuations of the shallow-water areas are considerable (Sorokin, 1983; Kolarov, 1993).

All these features have a strong limiting impact on species diversity of the Black Sea. Even though there are probably fewer than 200 species of marine molluscs and several

malacological research projects have been conducted there, no truly useful faunal inventory has ever been made.

Especially confused is the situation regarding one of the most species-rich families of marine molluscs in the Black Sea, the Pyramidellidae. The works of Milaschewitch¹ (1916), Golikov & Starobogatov (1972) and Grossu (1986a) added greatly to our knowledge on the group, but a complete documentation of the Pyramidellidae is lacking. The relationship between the Black Sea fauna and that of the Mediterranean is one of the questions that remains unanswered, although four of the six new species described by Milaschewitch between 1909 and 1916 were considered endemic to the Black Sea.

In the present paper, we present a revision of the Black Sea Pyramidellidae. This revision is based on the examination of extensive newly-collected material, together with re-examination of older material, especially from the Milaschewitch collection.

MATERIALS AND METHODS

Material for this study consists mainly of specimens collected during 11 field trips conducted between 1979 and 1996 to the coast of southern Bulgaria and to the western Turkish coast (T. Wilke, Philadelphia — TWP). Samples taken from fresh beach drift were dried, sieved into fractions and examined under a stereomicroscope. A total of 2,500 shells of Pyramidellidae were identified. An additional number of molluscs was dredged or collected while SCUBA diving in the area around Sozopol (Bulgaria).

We also examined material deposited in the Zoological Museum of the Russian Academy of Sciences in St. Petersburg (ZMRAS), in the Zoological Museum in Berlin (ZMB), in the Naturmuseum Senckenberg in Frankfurt a.M. (NMSF), in the Institute of Fisheries in Varna, Bulgaria (IFV), and in the Academy of Natural Sciences in Philadelphia (ANSP).

The extensive collection of Milaschewitch in ZMRAS, consisting of material gathered between 1908 and 1916 in different parts of the Black Sea, proved to be extremely interesting. This collection is probably among the largest collections of Pyramidellidae from the Black Sea, and was the basis for Milaschewitch's faunistic and taxonomic study. Unfortunately, this collection is in relatively poor condition. A large part of it has deteriorated, mostly as a result of Byne's disease, and the condition of much of the remaining material is such that shell characteristics are no longer discernible.

SYSTEMATICS

A complete account of the synonymy of the treated Pyramidellidae is beyond the scope of this work. We restrict ourselves to listing those synonyms and records which deal specifically with the Black Sea Pyramidellidae. A more exhaustive account on this aspect is provided by Van Aartsen (1977, 1981, 1987, 1994) and Sabelli et al. (1990). The descriptions of the species given here are those of the Black Sea forms and are not meant as a general description of the pertinent taxa.

An additional complication concerns the incorrect spelling, and citation of author and

¹ For this author's name, we are not using the current English transliteration, but rather an older one, as this aids in locating the relevant papers in the literature.

publication date of scientific names in older Russian, Romanian and Bulgarian literature. Such incorrect citations are here corrected, without further comment.

Genus *Chrysallida* Carpenter, 1856

Chrysallida emaciata (Brusina, 1866) (figs. 1, 16a-c)

Turbonilla emaciata Brusina, 1866: 69.

Chrysallida emaciata (Brusina, 1866) — Nordsieck (1972: 96); Van Aartsen (1977: 56); Grossu (1986a: 22; 1986b: 389, 390, fig. 172); Wilke (1997: 8, pl. 2 fig. 6a,b).

Parthenina emaciata (Brusina, 1866) — Milaschewitch (1916: 97, fig.); Golikov & Starobogatov (1972: 137, pl. 6 fig. 15).

Chrysallida emaciata (B.D.D., 1883) — Il'ina (1966: 169, fig. 22, pl. 13 figs. 1-2).

Description: Shell cylindrical with $4\frac{1}{2}$ - $5\frac{1}{2}$ short and convex postlarval whorls. Sutures narrow and deep. Last whorl approximately 0.52-0.57 of total shell height. Protoconch intorted with 1-1.25 visible whorls. Angle of the protoconch axis with the shell axis about 140° . Protoconch smooth. Teleoconch sculptured with about 20-24 orthocline or slightly opisthocline ribs and 2 sharp, widely spaced spiral ridges below the periphery. Second spiral ridge often covered from the following whorl. Base sometimes with about 10 very thin spirals, much narrower than the real spiral ridges. Aperture broadly oval. Umbilical groove almost clear. Columellar tooth sometimes only visible on turning the shell to the left.

Colour: Glassy white.

Size: Up to 1.8 mm in height and 0.7 mm in width, according to Golikov & Starobogatov (1972) up to 2.5 mm high.

Distribution: Mediterranean, Sea of Marmara and Black Sea.

Chrysallida fenestrata (Jeffreys, 1848) (figs. 2, 17a-b)

Odostomia fenestrata Jeffreys, 1848: 345.

Chrysallida fenestrata (Forbes in Jeffreys, 1848) — Poppe & Goto (1991: 199).

Chrysallida fenestrata (Jeffreys, 1848) — Il'ina (1966: 174 fig. 24, pl. 13 fig. 8-12); Van Aartsen (1981: 65).

Parthenina fenestrata (Forbes, 1848) — Milaschewitch (1916: 100, pl. 3 fig. 45-47).

Tragula fenestrata (Forbes, 1848) — Golikov & Starobogatov (1972: 136, pl. 6 fig. 12); Grossu (1986a: 24); Grossu (1986b: 392, 393 fig. 175).

Turbonilla fenestrata (Forbes, 1848) — Nordsieck (1972: 132).

Description: Shell slender conoid with 6-8 postlarval whorls. Upper part of the whorls straight, lower part strongly curved inwards. Sutures deep. Last whorl approximately 0.4 of total shell height. Protoconch intorted with about 1.5 visible whorls. Angle of the protoconch axis with the axis of the shell about 130° . Protoconch smooth. Teleoconch with 16-20 sharply outlined, opisthocline (upper part) to prosocline (lower part) ribs and 3 spiral ridges. The third spiral ridge usually covered from the following whorl. Last whorl with 3-4 spiral ridges. Base with fine riblets. Aperture small and oval. Umbilical groove missing or insignificant. No columellar tooth.

Colour: Semitransparent white to yellowish.

Size: Up to 3.0 mm in height and 1.0 mm in width, according to Golikov & Starobogatov (1972) up to 3.5 mm in height.

Distribution: From British Isles to Mediterranean, Sea of Marmara and Black Sea.

Chrysallida incerta (Milaschewitch, 1916) (figs. 3, 18a-c)

Parthenina incerta Milaschewitch, 1916: 98.

Chrysallida spiralis (Montagu, 1803) — Il'ina (1966: 171).

Chrysallida turbonilloides (Brusina, 1869 non Deshayes, 1861) — Van Aartsen (1977: 53).

Chrysallida incerta (Milaschewitch, 1916) — Golikov & Starobogatov (1972: 136, pl.6 fig. 13); Nordsieck (1972: 100); Grossu (1986a: 22); Grossu (1986b: 386 fig. 169).

Chrysallida spiralis incerta (Milaschewitch, 1916) — Il'ina (1966: 172 fig. 23, pl.13 fig.4-7).

Parthenina incerta Milaschewitch, 1916 — Milaschewitch (1916: 98 fig.).

Chrysallida brusinai (Cossmann, 1921) — Sabelli et al. (1990: 220); Van der Linden & Eikenboom (1992: 11); Wilke (1997: 9, pl.2 fig. 7a, b).

Description: Shell conoid with 3-4 (5) flat postlarval whorls. Sutures broad and deep. Last whorl approximately 0.62-0.74 of total shell height. Protoconch intorted with 1-1.25 visible whorls. Angle of the protoconch axis with the axis of the shell about 160°. Protoconch smooth. Teleoconch with 20-25 sharply outlined, straight ribs and 2 spiral ridges. Second spiral ridge usually covered from the following whorl. Base with fine riblets and 5 additional spiral ridges. Aperture oval. Umbilical groove almost clear. Columellar tooth usually visible on turning the shell to the left.

Colour: Glassy white.

Size: Up to 1.7 mm in height and 0.6 mm in width.

Distribution: Mediterranean, Sea of Marmara, Black Sea and probably Sea of Azov.

Discussion: As discussed by Van Aartsen & Menkhorst (1996: 51) the correct name for this Mediterranean species is the one proposed by Milaschewitch (1916: 98).

Chrysallida obtusa (T. Brown, 1827) (figs. 4, 19a-c)

Jamnia obtusa Brown, 1827: pl. 50 fig. 38.

Chrysallida interstincta (Montagu, 1803) — Il'ina (1966: 166,167 fig. 21, pl.12 fig. 23-32); Nordsieck (1972: 92, pl. P1 fig. 8); Grossu (1986a: 22); Grossu (1986b: 387 fig. 170).

Parthenina interstincta (Montagu, 1803) — Golikov & Starobogatov (1972: 137, pl.6 fig. 17).

Chrysallida obtusa (T. Brown, 1827) — Van Aartsen (1977: 57); Wilke (1997: 9, pl.2 fig. 8a-c).

(?) *Chrysallida delpretei* (Sullioti, 1889) — Grossu (1986a: 23 fig. 3); Grossu (1986b: 390 fig. 173).

Parthenina tenuistriata Milaschewitch, 1909 — Milaschewitch (1909: 314); Milaschewitch (1916: 96 fig.).

Description: Shell very variable in shape, from compact conoid to slender cylindrical. There are 5-7½ slightly curved postlarval whorls. Sutures narrow and deep. Last whorl approximately 0.48-0.56 of total shell height. Protoconch intorted, 1-1.5 visible whorls. Angle of the protoconch axis with the axis of the shell 120-160°. Protoconch smooth. Sculpture of the teleoconch very variable. Last whorl with 12-26 gently curved ribs of an inverted S-shape and one spiral ridge (sometimes second ridge visible on the upper whorls). The ribs turn abruptly into the raised base just below the spiral ridge. Sometimes spiral sculpture indistinct or completely absent and ribs at the last whorl only faintly distinguishable. Base often with clear growth lines. Aperture oval, tapering above. Umbilical groove almost clear. Columellar tooth directly visible.

Colour: Semitransparent white to yellowish.

Size: Up to 3.4 mm in height and 1.1 mm in width.

Distribution: Norway to Canary Islands, Mediterranean, Sea of Marmara, Black Sea and Sea of Azov.

Discussion: Material under the name *Parthenina tenuistriata* identified by Milaschewitch himself shows without doubt that that species is based on one of the many forms of the variable *C. obtusa*. This fact was already mentioned by Micali et al. (1993: 149, fig. 4; 150) but unfortunately one could read the text in a different way.

Chrysallida terebellum (Philippi, 1844) (figs. 5, 20a-b)

Chemnitzia terebellum Philippi, 1844: 138, pl. 24 fig. 12.

Chrysallida terebellum (Philippi, 1844) — Van Aartsen (1977: 56); Van der Linden & Eikenboom (1992: 15).

Parthenina costulata Milaschewitch, 1916 — Milaschewitch (1916: 95 fig.).

Description: Shell slender conical with 5-7 flat postlarval whorls. Clear and narrow sutures. Last whorl approximately 0.45-0.50 (0.55) of total shell height. Protoconch intorted, 1-1.5 visible whorls. Angle of the protoconch axis with the shell axis 120-150° (160°). Protoconch smooth. Teleoconch with 20-26 ribs of an inverted s-shape, clear outlined. Ribs on the last whorl end abruptly at the base, as in *C. obtusa*. Spiral sculpture consists of one clear ridge, a second ridge on the upper whorls is usually covered by the following whorl. Base with fine growth lines. Clear umbilical groove. Columellar tooth directly visible.

Colour: Semitransparent white to yellowish.

Size: According to Golikov & Starobogatov (1972) up to 4.0 mm in height and 1.0 mm in width.

Distribution: From northern Brittany to the Mediterranean, the Sea of Marmara and the Black Sea.

Discussion: As discussed by Van Aartsen (1977: 55), true *Chrysallida terebellum* is closely related to *C. obtusa* but has a more slender-conic profile, flat whorls and usually fewer axial ribs. It is frequently larger than *C. obtusa*. The species called *C. terebellum* by Nordsieck (1972: 94) and others is related to *C. indistincta* (Montagu, 1808) and may belong to *C. juliae* (De Folin, 1872). Specimens identified by Milaschewitch as belonging to his own species *Parthenina costulata* make it clear that that species is synonymous with *C. terebellum* (Philippi, 1844).

Genus *Eulimella* Forbes & MacAndrew, 1846

Eulimella acicula (Philippi, 1836) (figs. 6, 21a-b).

Melania acicula Philippi, 1836: 158, pl. 9 figs 6, 6a.

Eulimella laevis (T. Brown, 1827) — Poppe & Goto (1991: 201).

(?) *Eulimella scillae* (Scacchi, 1835) — Golikov & Starobogatov (1972: 135, pl. 6 fig. 10); Grossu (1986a: 220; Grossu (1986b: 382 fig. 166).

Belonidium acicula (Philippi, 1836) — Golikov & Starobogatov (1972: 134, pl. 6 fig. 9); Grossu (1986a: 22 fig. 2); Grossu (1986b: 383 fig. 167).

Eulimella acicula (Philippi, 1836) — Milaschewitch (1916: 90, pl. 3 fig. 35); Il'ina (1966: 182 fig. 29, pl. 14 fig. 1, 2); Nordsieck (1972: 119); Van Aartsen (1994: 96); Wilke (1997: 10, pl. 2 fig. 9a, b).

Eulimella turris (Forbes, 1844) — Milaschewitch (1916: 90).

Description: Shell conical with 7-10 slightly convex postlarval whorls. Apical whorls slightly cyrtoconoid. Sutures incised. Last whorl approximately 0.40-0.48 of total shell height. Protoconch helicoid with about 2 whorls. Angle of the protoconch axis with

the axis of the shell 90-105°. Protoconch smooth. Teleoconch with fine prosocline growth lines and with very fine spiral striae. Clear sinus. Aperture oval. Shallow umbilical groove. Columellar tooth absent.

Colour: Semitransparent white.

Size: Up to 2.0 mm in height and 0.7 mm in width, according to Grossu (1986b) up to 3.5 mm in height.

Distribution: From Ireland south to Mediterranean, Sea of Marmara and Black Sea.

Discussion: As noted by Van Aartsen (1994: 97, 98), *Eulimella laevis* (T. Brown, 1827) is considered a nomen dubium, and should no longer be used.

One specimen from Sevastopol (ex coll. ZMRAS) identified as *Eulimella turris* (Forbes, 1844) by Milaschewitch proved to belong to the variable *E. acicula* and not to *Eulimella scillae* (Scacchi, 1835) as considered by some workers.

Grossu's figure of *E. scillae* (1986b: 382 fig. 166) is unrecognizable and Golikov & Starobogatov (1972: pl.6 fig. 10) copied a figure from Kobelt (1903: pl. 75 fig. 25). It is not clear what these authors were describing but we doubt very much the occurrence of *E. scillae* in the Black Sea.

Genus *Anisocycla* Monterosato, 1880

Anisocycla pointeli (De Folin, 1868) (figs. 7, 22a-c)

Turbonilla pointeli De Folin, 1868: 100, pl. 11 fig.4.

Anisocycla pointeli (De Folin, 1868) — Van Aartsen (1994: 93,94).

Eulimella nitidissima (Montagu, 1803) — Il'ina (1966: 184,185 fig. 30, pl. 14 fig.3-5).

Ebala pointeli (De Folin, 1868) — Golikov & Starobogatov (1972: 134, pl. 6 fig. 8); Nordsieck (1972: 120); Grossu (1986a: 22); Grossu (1986b: 384 fig. 168).

Eulimella pointeli (De Folin, 1868) — Milaschewitch (1916: 91 fig.).

Description: Shell very slender conical with 7-9 convex postlarval whorls. Sutures deep. Last whorl approximately 0.32-0.42 of total shell height. Protoconch intorted, about 1.5 whorls. Angle of the protoconch axis with the axis of the shell 110-130°. Protoconch smooth. Teleoconch with fine opisthocline or orthocline growth lines. Sometimes also with microscopical fine spiral striae. Aperture oval. Umbilical groove slight or insignificant. Columellar tooth absent.

Colour: Glassy white to pale cream.

Size: Up to 3.0 mm in height and 0.75 mm in width.

Distribution: Mediterranean, Sea of Marmara and Black Sea.

Genus *Odostomia* Fleming, 1813

Odostomia acuta Jeffreys, 1848 (figs. 8, 23)

Odostomia acuta Jeffreys, 1848: 338.

Odostomia acuta Jeffreys, 1848 — Milaschewitch (1916: 88 fig.); Il'ina (1966: 158 fig. 17 pl. 12 fig. 5); Golikov & Starobogatov (1972: 132, pl. 6 fig. 3); Nordsieck (1972: 108); Grossu (1986a: 21); Grossu (1986b: 375 fig. 159); Van Aartsen (1987: 8, 11); Poppe & Goto (1991: 201).

Description: Shell conoid with 5-6 moderately convex postlarval whorls. Sutures incised. Last whorl approximately 0.45-0.55 of total shell height. Protoconch helicoid

with about 2 whorls. Angle of the protoconch axis with the shell axis 95°. Protoconch smooth. Teleoconch with orthocone to slightly prosocline growth lines, sometimes also opisthocline. Weak sinus. Aperture oval. Deep umbilical groove with clear umbilicus. Columella with marked tooth.

Colour: Semitransparent white to cream.

Size: According to Milaschewitch (1916) up to 4.5 mm in height and 2.0 mm in width.

Distribution: From Lofodden Islands south into Mediterranean, Sea of Marmara and Black Sea.

Odostomia erjaveciana Brusina, 1869 (figs. 9, 24a-c)

Odostomia erjaveciana Brusina, 1869: 242.

Odostomia erjaveciana Brusina, 1869 — Il'ina (1966: 164, 165 fig. 20, pl. 12 fig. 19-22); Golikov & Starobogatov (1972: 133, pl. 6, fig. 6); Van Aartsen (1987: 16, 18); Wilke (1997: 10, pl. 2 fig. 10a,b).

Odostomia nitens Jeffreys, 1870 — Nordsieck (1972: 114); Grossu (1986a: 21); Grossu (1986b: 379, 380, fig. 164).

Description: Shell slender conoid with 5-6½ slightly convex postlarval whorls. Sutures incised. Last whorl approximately 0.60-0.65 of total shell height. Protoconch intorted with about 1-1.25 visible whorls. Angle of the protoconch axis with the shell axis 130-160°. Protoconch smooth. Teleoconch with orthocone growth lines and sometimes with fine spiral striae. More or less clear sinus. Aperture oval. Umbilical groove small or absent. No real columellar tooth but an insignificant fold.

Colour: Glassy white to pale cream.

Size: Up to 3.0 mm in height and 1.05 mm in width.

Distribution: Mediterranean, Sea of Marmara and Black Sea.

Discussion: The specimens identified as the deep-water species *Odostomia nitens* Jeffreys, 1870, by Nordsieck (1972) and Grossu (1986a, b) without a doubt belong to *O. erjaveciana* as well.

Odostomia eulimoides Hanley, 1844 (figs. 10, 25a-c)

Odostomia eulimoides Hanley, 1844: 18

Odostomia eulimoides Hanley, 1844 — Van Aartsen (1987: 10, 14).

Odostomia pallida (Montagu, 1803) — Il'ina (1966: 161 fig. 18, 162 fig. 19, pl. 12 fig. 7-18); Golikov & Starobogatov (1972: 133, pl. 6 fig. 4); Grossu (1986a: 21); Grossu (1986b: 377, 378 fig. 162).

(?) *Odostomia ambigua novegradensis* (Brusina, 1865) — Nordsieck (1972: 111).

Odostomia novegradensis Brusina, 1865 — Milaschewitch (1916: 86, pl. 3 fig. 29-31).

Description: Shell conoid with 3-5 slightly convex postlarval whorls. Sutures incised. Last whorl approximately 0.65-0.75 of total shell height. Protoconch intorted with about 1-1.25 visible whorls. Angle of the protoconch axis with the shell axis about 140°. Protoconch smooth. Teleoconch with prosocline growth lines. Clear sinus. Aperture oval. Clear umbilical groove, umbilicus almost absent. Columellar tooth usually visible on turning the shell to the left.

Colour: Semitransparent white to pale cream.

Size: Up to 3.4 mm in height and 2.0 mm in width, according to Il'ina (1966) up to 6.5 mm in height.

Distribution: From Arctic south to Mediterranean, Sea of Marmara, Black Sea and southern part of Sea of Azov.

Odostomia plicata (Montagu, 1803) (figs. 11, 26a-b)

Turbo plicata Montagu, 1803: 325, pl. 21, fig. 2.

Odostomia plicata (Montagu, 1803) — Milaschewitch (1916: 89 fig.); Il'ina (1966: 155, 156, fig. 16, pl. 12 fig. 3, 4); Golikov & Starobogatov (1972: 133, pl. 6 fig. 6); Nordsieck (1972: 113); Grossu (1986a: 21); Grossu (1986b: 378, 379 fig. 163); van Aartsen (1987: 8, 11); Poppe & Goto (1991: 202).

Description: Shell conoid with 4-5 near flat postlarval whorls. Sutures incised. Last whorl approximately 0.60 of total shell height. Protoconch helicoid with about 2 whorls. Angle of the protoconch axis with the shell axis 95°. Protoconch smooth. Teleoconch with orthocone to slightly prosocline growth lines. Aperture oval. Deep umbilical groove. Umbilicus small or absent. Columella with marked tooth.

Colour: Semitransparent white to yellowish.

Size: Up to 2.1 mm in height and 0.95 mm in width. According to Golikov & Starobogatov (1972) up to 3.0 mm in height and 1.1 mm in width.

Distribution: From Scandinavia to Mediterranean, Sea of Marmara and Black Sea.

Odostomia scalaris MacGillivray, 1843 (figs. 12, 27a-c)

Odostomia scalaris MacGillivray, 1843: 154.

Odostomia scalaris MacGillivray, 1843 — Van Aartsen (1987: 12); Sabelli et al. (1990: 224).

Odostomia rissoides Hanley, 1844 — Golikov & Starobogatov (1972: 132, pl. 6 fig. 2); Grossu (1986a: 21); Grossu (1986b: 377, fig. 161).

Odostomia rissoiformis Milaschewitch, 1916 — Milaschewitch (1909: 315 n.n.); Milaschewitch (1916: 87, pl. 3 fig. 32-34).

Description: Shell conoid with 3-5 convex postlarval whorls. Sutures incised. Last whorl approximately 0.65-0.70 of total shell height. Protoconch intorted with about 1-1.25 visible whorls. Angle of the protoconch axis with the shell axis about 130°. Protoconch smooth. Teleoconch with orthocone growth lines, sometimes with fine spiral striae. Clear sinus. Aperture oval. Clear umbilical groove with more or less clear umbilicus. Columellar tooth usually visible on turning the shell to the left.

Colour: Semitransparent white to pale cream.

Size: Up to 2.5 mm in height and 1.1 mm in width. According to Golikov & Starobogatov (1972) up to 3.0 mm in height and 1.5 mm in width.

Distribution: From southern Scandinavia to Mediterranean, Sea of Marmara and Black Sea.

Discussion: The name *O. rissoiformis* was first mentioned by Milaschewitch in 1909 but that is a nomen nudum. It was validly described in 1916 for the first time and, on the basis of material in ZMRAS and ANSP, is clearly identical with the variable *O. scalaris*.

Genus *Noemiamea* De Folin in Hoyle, 1886*Noemiamea dolioliformis* (Jeffreys, 1848) (figs. 13, 28a-b).

Odostomia dolioliformis Jeffreys, 1848: 342.

Menestho dolioliformis (Jeffreys, 1848) — Il'ina (1966: 176, fig. 25,26).

Noemiamea dolioliformis (Jeffreys, 1848) — Golikov & Starobogatov (1972: 135, pl. 6, fig. 11).

Description: Shell ovoid with 2-3 convex postlarval whorls. Sutures deep. Last whorl approximately 0.80-0.85 of total shell height. Protoconch helicoid with about 2 whorls. Angle of the protoconch axis with the shell axis 90-95°. Protoconch smooth. Teleoconch sculptured with clear spiral ridges, about 15-20 on body whorl, and clear prosocline growth lines. Growth lines on the base prominent. Aperture broadly oval. Umbilical groove almost clear. Umbilicus indistinct. Columellar tooth sometimes only visible on turning the shell to the left.

Colour: Semitransparent pale cream.

Size: Up to 1.2 mm in height and 1.0 mm in width.

Distribution: British Isles to Mediterranean, Sea of Marmara and Black Sea.

Genus *Turbonilla* Risso, 1826*Turbonilla delicata* (Monterosato, 1874) (figs. 14, 29a-c)

Odostomia delicata Monterosato, 1874: 267.

(?) *Turbonilla rufa* (Philippi, 1836) — Il'ina (1966: 181, pl. 13, fig. 13).

Turbonilla gracilis (Philippi, 1844) — Ostroumova (1893: 18,42,50).

Turbonilla delicata (Monterosato, 1874) — Milaschewitch (1916: 93, pl. 3, fig. 39-41); Il'ina (1966: 178, 179 fig. 27, pl. 13, fig. 14-19); Golikov & Starobogatov (1972: 138, pl. 6, fig. 18); Nordsieck (1972: 125); Van Aartsen (1981: 69); Grossu (1986a: 24); Grossu (1986b: 395, fig. 177).

Description: Conical with 7-10 moderately convex postlarval whorls. Suture not very deep. Last whorl approximately 0.35-0.42 of total shell height. Protoconch helicoid with about 2 whorls. Angle of the protoconch axis with the shell axis 90-95°. Protoconch smooth. Teleoconch sculptured with clear, straight or slightly opisthocline ribs, about 18-20 on body whorl. Growth lines often indistinct. Base only with slightly sculptured growth lines. Aperture rhomboid. Columella slightly turned. Lip thin. Weak umbilical groove. No columellar tooth.

Colour: Glassy white to pale cream.

Size: Up to 4.6 mm in height and 1.3 mm in width.

Distribution: Mediterranean, Sea of Marmara and Black Sea.

Turbonilla pusilla (Philippi, 1844) (figs. 15, 30a-c)

Chemnitzia pusilla Philippi, 1844: 224 pl. 28 fig. 21.

Turbonilla obliquata (Philippi, 1844) — Il'ina (1966: 180, fig. 28, pl. 13, fig. 20-25).

Turbonilla pusilla (Philippi, 1844) — Golikov & Starobogatov (1972: 138, pl. 6 fig. 19); Nordsieck (1972: 124);

Van Aartsen (1981: 71); Grossu (1986a: 23, fig. 4, 24); Grossu (1986b: 394, fig. 176).

(?) *Turbonilla pupaeformis* Milaschewitch, 1916 — Milaschewitch (1916: 92, pl. 3 fig. 36-38).

Description: Conical with 7-9 slightly convex postlarval whorls. Apical whorls more cyrtocoid, basal whorls more cylindrical. Suture not very deep. Last whorl approximately 0.35-0.45 of total shell height. Protoconch helicoid with about 2 whorls. Angle of the protoconch axis with the shell axis 95-105°. Protoconch smooth. Teleoconch sculptured with clear, ophistocline ribs, about 16-20 on body whorl. Growth lines often indistinct. Base only with slightly sculptured growth lines. Aperture small and rhomboid. Columella short, slight thickened and turned. Lip thick. Slight umbilical groove. No columellar tooth.

Colour: Semitransparent white to pale cream.

Size: Up to 3.4 mm in height and 1.1 mm in width, according to Golikov & Starobogatov (1972) up to 4.5 mm in height and 1.5 mm in width.

Distribution: From Ireland south to Mediterranean, Sea of Marmara and Black Sea.

DOUBTFUL SPECIES OF THE FAMILY PYRAMIDELLIDAE IN THE BLACK SEA

Chrysallida indistincta (Montagu, 1808)

Turbo indistinctus Montagu, 1808: 129.

Chrysallida indistincta (Montagu, 1808) — Il'ina (1966: 170, pl. 13 fig. 3).

Parthenina indistincta (Montagu, 1808) — Milaschewitch (1916: 101); Golikov & Starobogatov (1972: 136, pl. 6 fig. 14)

(?) *Chrysallida terebellum* (Philippi, 1844) — Nordsieck (1972: 94); Grossu (1986a: 22); Grossu (1986b: 391 fig. 174).

(?) *Parthenina indistincta* var. *mediterranea* Milaschewitch, 1916 — Milaschewitch (1916: 102 fig.).

Discussion: As far as can be made out from the descriptions and figures cited above, it is possible that the species mentioned here is in fact *Chrysallida juliae* (De Folin, 1872) which Nordsieck (1972: 94) called *C. terebellum* (see our remarks under that name). We have not seen any material of *C. indistincta* or of *C. juliae* from the Black Sea and so cannot give any more details.

We did study some shells identified by Milaschewitch as his var. *mediterranea*. These shells may belong to either species and are not sufficiently well preserved for positive identification. This leaves *C. indistincta* var. *mediterranea* (Milaschewitch, 1916) an obscure taxon, presently not identifiable.

Chrysallida cf. *pontica* Grossu, 1986

Chrysallida pontica Grossu, 1986a: 24, 25 fig. 5.

Chrysallida pontica Grossu, 1986 — Grossu (1986b: 388, fig. 171); Sabelli et al. (1990: 221).

Discussion: *Chrysallida* cf. *pontica* has been found probably only once in 1952 at a single location near the estuary of the Danube River. We have attempted to obtain the types of this species, but these are unavailable to date.

Odostomia albella (Lovén, 1846)

Turbonilla albella Lovén, 1846: 19.

Odostomia albella (Lovén, 1846) — Golikov & Starobogatov (1972: 134, pl. 6 fig. 7); Grossu (1986a: 21); Van Aartsen (1987: 13); Grossu (1986b: 376, fig. 160).

Discussion: Grossu (1986a) mentioned *Odostomia rissoides* (= *O. scalaris*) separately, next to *O. albella*. His description of *O. albella*, however, is reminiscent of *O. scalaris* and we therefore believe that *O. albella* as in Grossu (1986a, b) is likely to be *O. scalaris*. The same is probably true for the specimens identified as *O. albella* by Golikov & Starobogatov (1972).

FINAL REMARKS

The Pyramidellidae, as well as the other marine Black Sea malacofauna, originate from the Mediterranean fauna, primarily after the reopening of the connection with the Mediterranean (about 7,000 years ago). It is therefore no surprise that all of the Pyramidellidae described from the Black Sea turn out to be previously established Mediterranean taxa. A possible exception is *Chrysallida* cf. *pontica* Grossu, 1986, the identity of which remains unclear.

It is remarkable that no Pyramidellidae appear to be restricted to the coastal regions of the Black Sea around the Bosphorus. It appears that the contemporary influence of the Bosphorus on the malacofauna of the Black Sea is more limited than hitherto believed. Yüce (1990) reported a vertical stratification of low salinity Black Sea water (approximately 19 ‰) in the upper layer, and highly saline Mediterranean water (> 37 ‰) in the lower layer in the Bosphorus. The heavier, highly saline water moves from the Bosphorus in a northwestwardly direction in a narrow stream that finally disappears in the deep, hydrogen sulfide rich zone of the Black Sea. In this way, it has no substantial effect on the shallow coastal waters. Moreover, many Pyramidellidae have only a short free swimming veliger-larvae stage. Combined, these two factors make it unlikely that they can successfully colonize suitable habitats in the Black Sea by migrating from the Sea of Marmara as pelagic larvae.

The distribution maps of the Pyramidellidae indicate that relatively few records are available from northern Bulgaria, Georgia and Turkey. The most likely cause for this is that these regions have not been studied intensively. It should also be noted that many of the records from Romania, Ukraine and Russia are from the beginning of the twentieth century.

We hope that future malacological studies in the Black Sea will no longer be restricted to a few, relatively large species, but attempt to include the whole spectrum of the malacofauna, as exemplified by the recent study of Mutlu (1995).

ACKNOWLEDGEMENTS

We wish to thank Professor Yaroslav I. Starobogatov (ZMRAS), Professor Rudolf Kiliyas (MNHB) and Dr. Ronald Janssen (NMSF) for their friendly support. We thank Dr. David Robinson (U.S. Department of Agriculture) for critical comments on the manuscript. The support of the Alexander von Humboldt Foundation in Bonn (Germany) is gratefully acknowledged.

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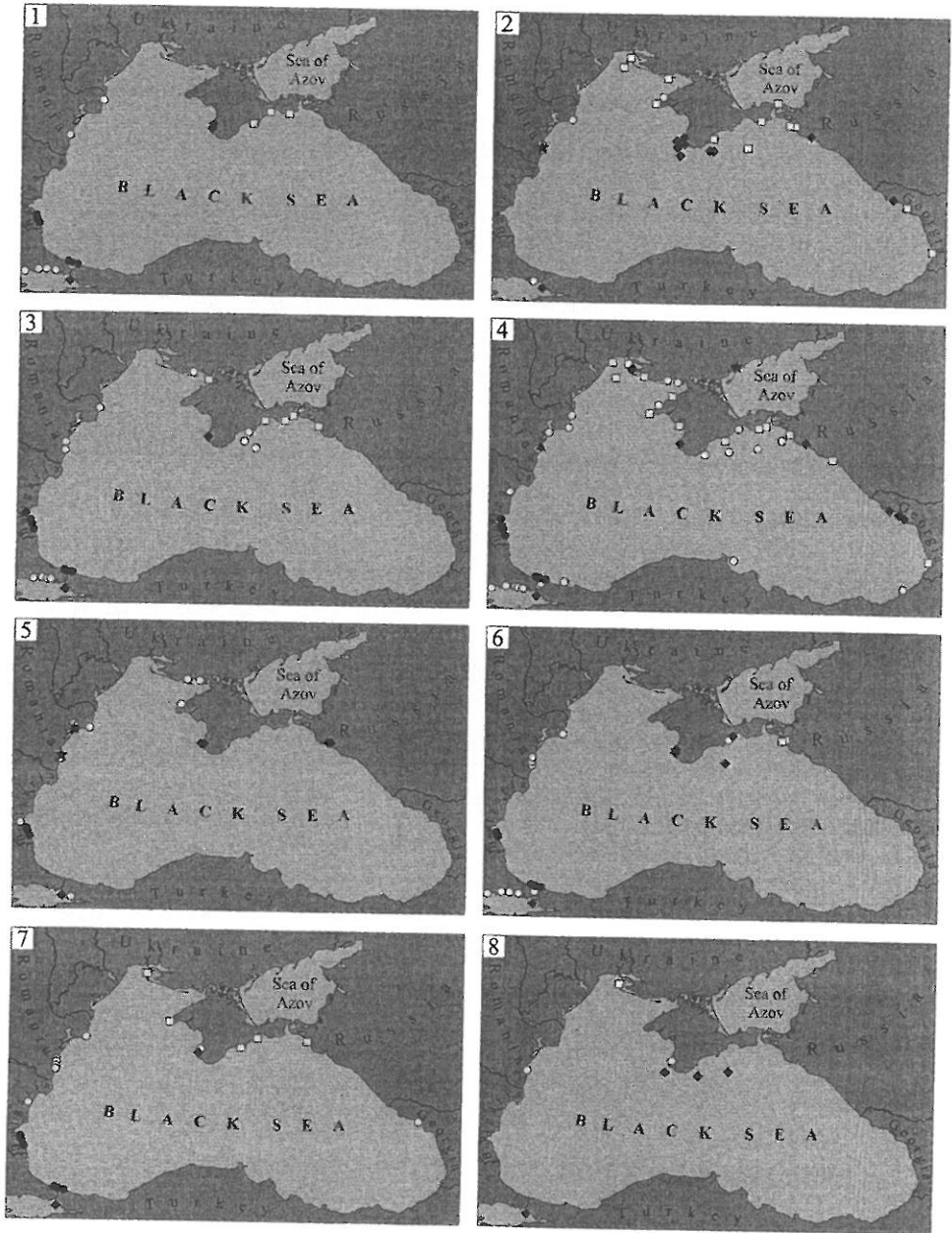


Fig. 1-8. Distribution maps of Black Sea Pyramidellidae. 1, *Chrysallida emaciata*; 2, *Chrysallida fenestrata*; 3, *Chrysallida incerta*; 4, *Chrysallida obtusa*; 5, *Chrysallida terebellum*; 6, *Eulimella acicula*; 7, *Anisocyclus pointeli*; 8, *Odostomia acuta*.

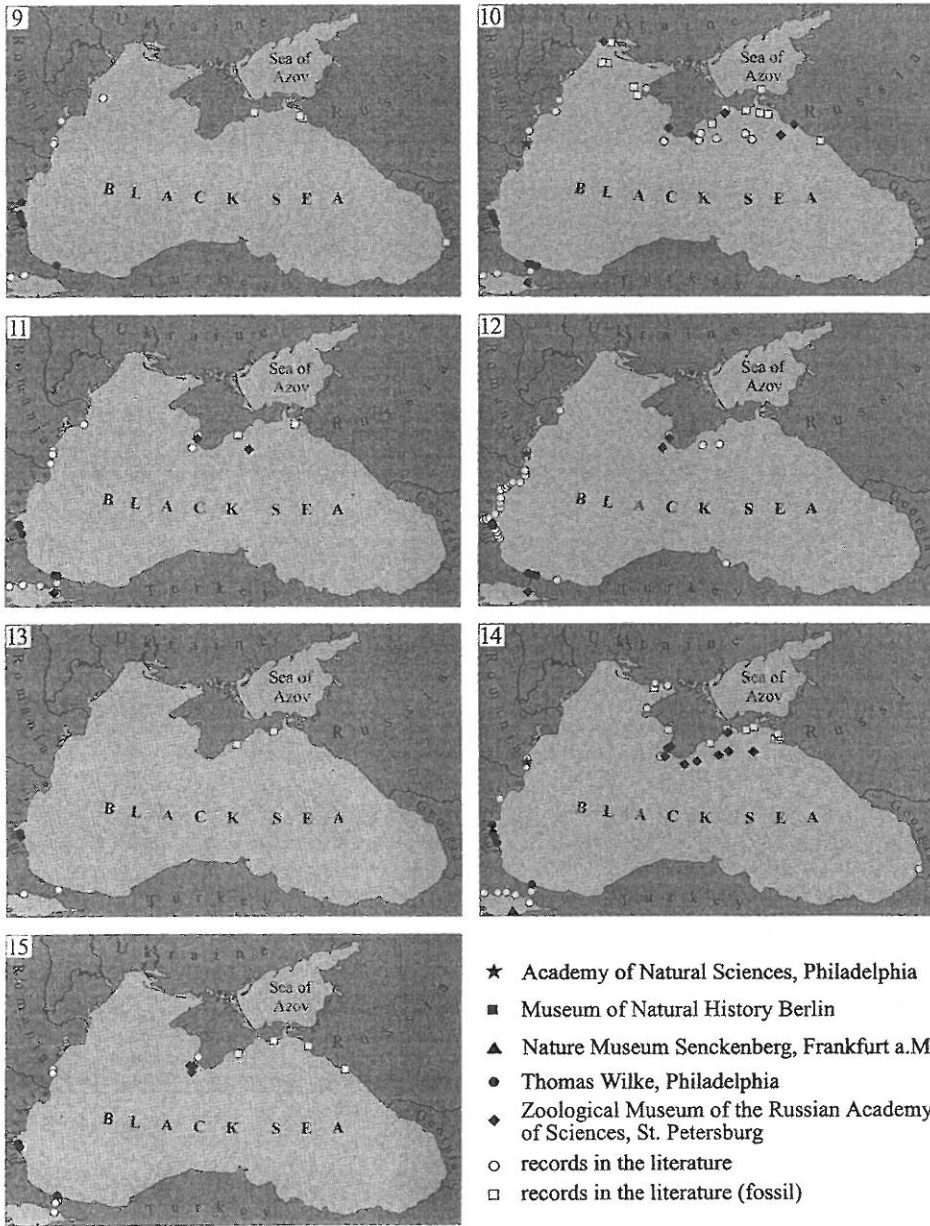


Fig. 9-15. Distribution maps of Black Sea Pyramidellidae. 9, *Odostomia erjaveciana*; 10, *Odostomia eulimoides*; 11, *Odostomia plicata*; 12, *Odostomia scalaris*; 13, *Noemiamea dolioliformis*; 14, *Turbonilla delicata*; 15, *Turbonilla pusilla*.

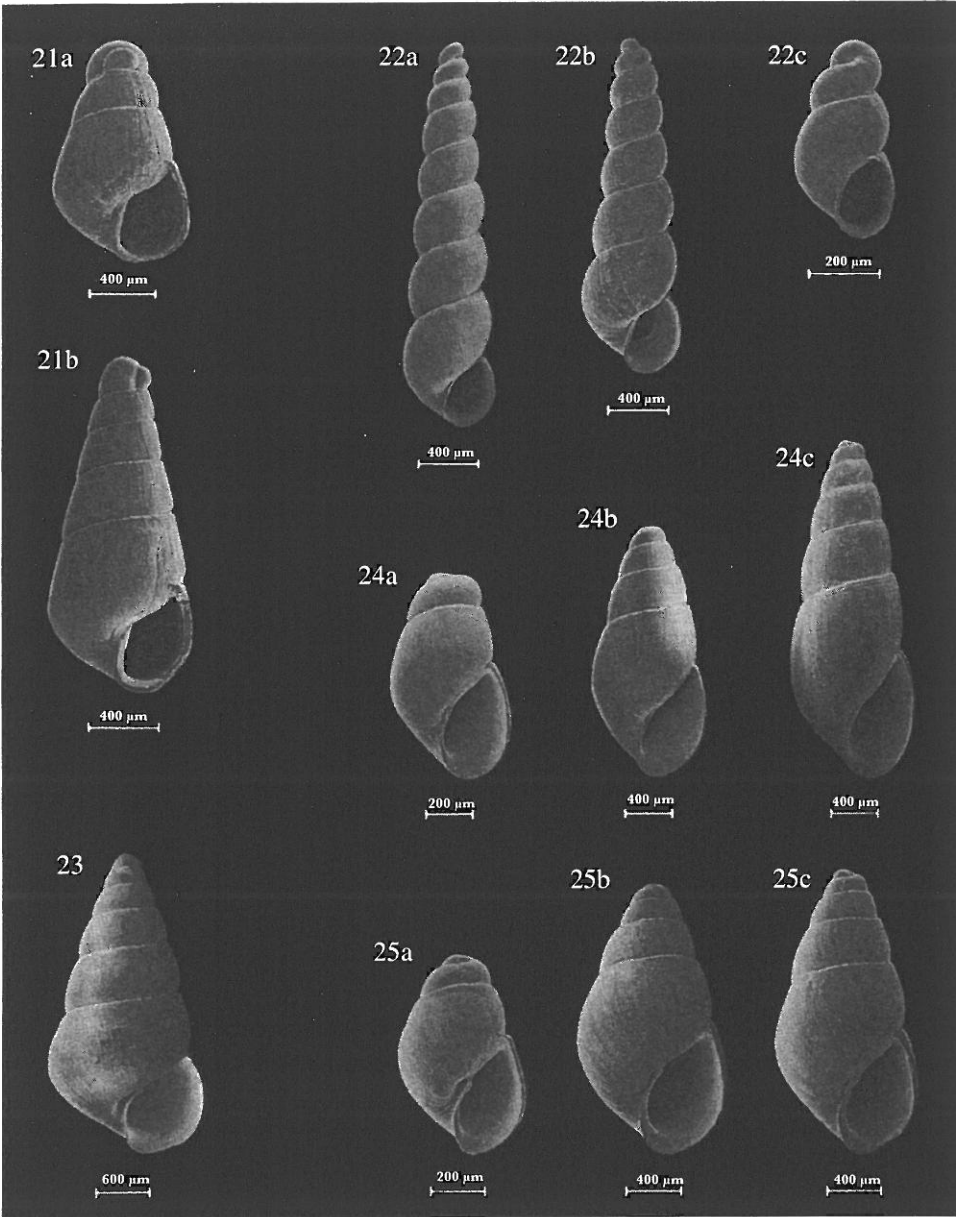


Fig. 21-25. Black Sea Pyramidellidae shells, *Eulimella* (21), *Anisocyclus* (22) and *Odostomia* (23-25) spec. 21a-b, *Eulimella acicula* (Bulgaria, Djuni); 22a-c, *Anisocyclus pointeli* (Bulgaria, Ropotamo estuary); 23, *Odostomia acuta* (Sea of Marmara, Büyükada — ex coll. ZMRAS); 24a-c, *Odostomia erjaveciana* (Bulgaria, Ropotamo estuary); 25a-c, *Odostomia eulimoides* (a and c, Bulgaria, Ropotamo estuary; b, Turkey, Anadoluferici).

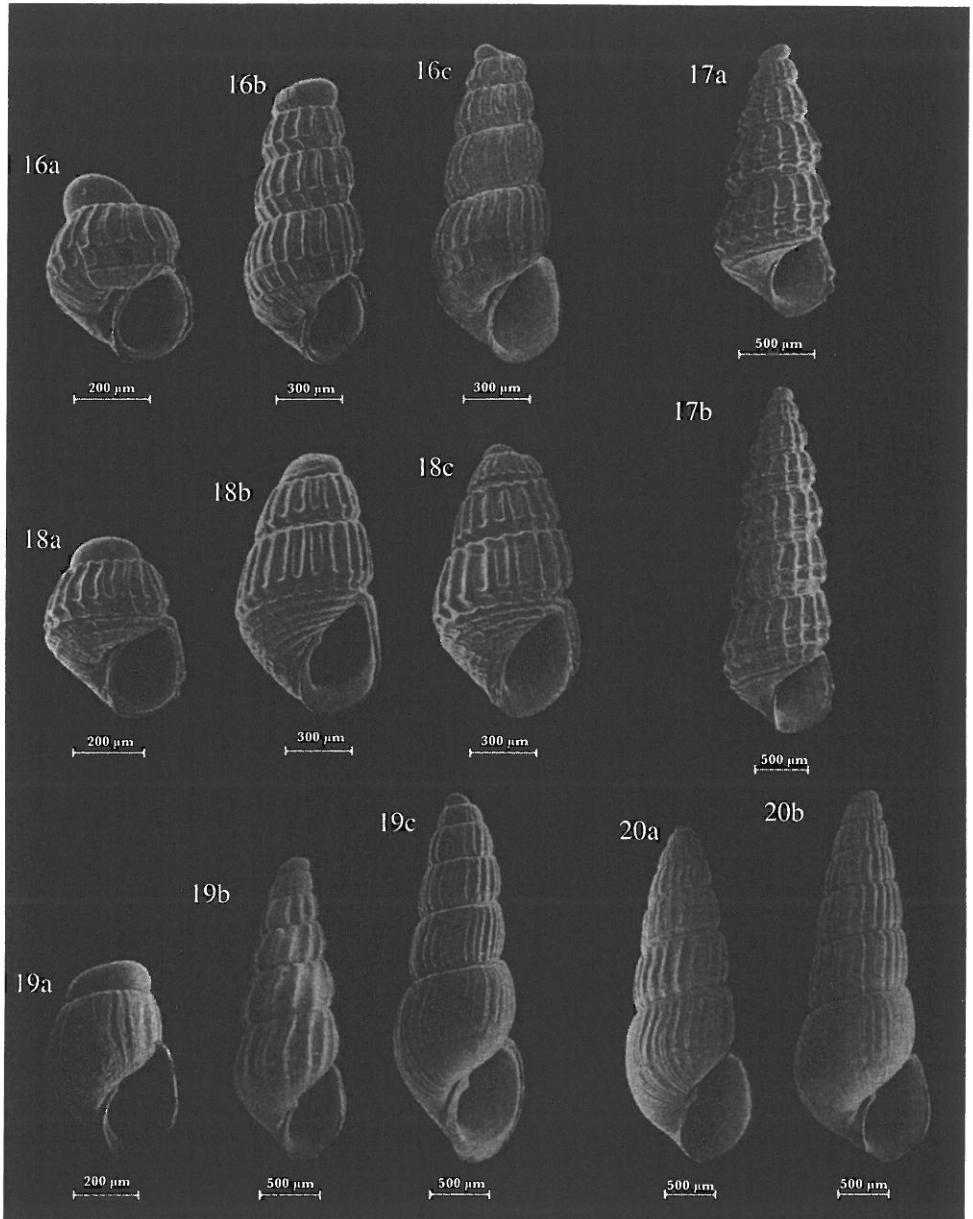


Fig. 16-20. Black Sea Pyramidellidae shells, *Chrysallida* spec. 16a-c, *Chrysallida emaciata* (Bulgaria, Ropotamo estuary); 17a-b, *Chrysallida fenestrata* (Ukraine, 20 km SW. of Sevastopol — ex coll. ZMRAS); 18a-c, *Chrysallida incerta* (Bulgaria, Ropotamo estuary); 19a-c, *Chrysallida obtusa* (a, Bulgaria, Djuni; b-c, Bulgaria, Ropotamo estuary); 20a-b, *Chrysallida terebellum* (a, Bulgaria, Ropotamo estuary; b, Bulgaria, Djuni).

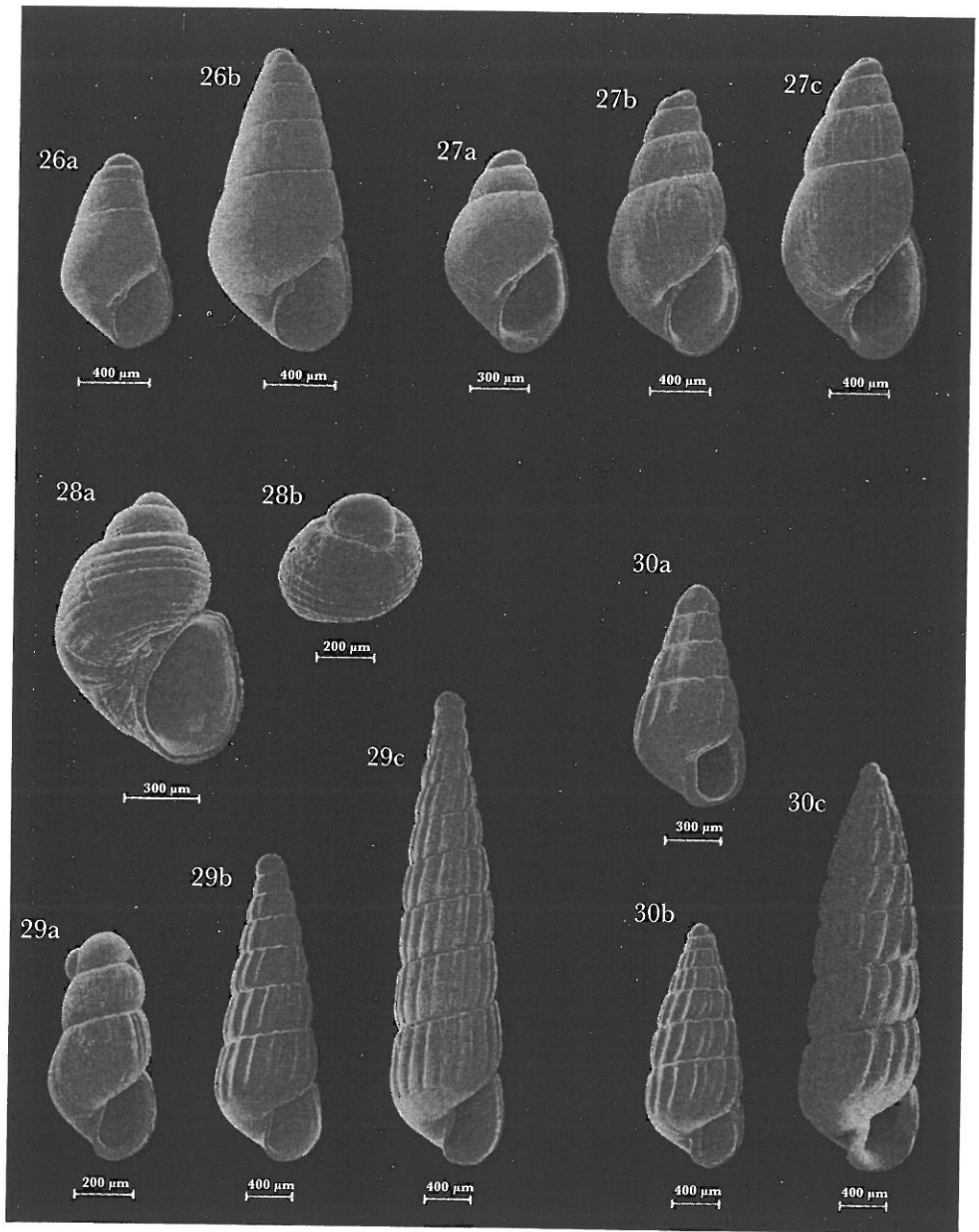


Fig. 26-30. Black Sea Pyramidellidae shells, *Odostomia* (26, 27), *Noemiamea* (28) and *Turbonilla* (29, 30) spec. 26a-b, *Odostomia plicata* (a, Bulgaria, Ropotamo estuary; b, Turkey, Rumelifeneri); 27a-c, *Odostomia scalaris* (Bulgaria, Ropotamo estuary); 28a-b, *Noemiamea dolioliformis* (Bulgaria, Ropotamo estuary); 29a-c, *Turbonilla delicata* (Bulgaria, Ropotamo estuary); 30a-c, *Turbonilla pusilla* (a, Bulgaria, Ropotamo estuary; b, Bulgaria, Djuni; c, Ukraine, Sevastopol — ex coll. ZMRAS).

